

## AD-3: Redesign Terminal Airspace and Routes

### Benefits, Performance and Metrics

- Increase on-time departures.
- Increase airport capacity utilization effectiveness.
- Improved predictability

A procedure is predictable if the time to fly the procedure and the distance flown each time the procedure is executed is close to the same. Some ARTS track data for the CLT NALEY departure procedure from Sept 8 and 9, 2000 was used to compute average flying times and distances and their dispersions. This data set provided 14 flights that flew the departure procedure and during this same period there were 37 flights that did not fly the procedure. These flights were aircraft departing to the same departure fix as for NALEY, so it was appropriate to compare the flying times and distances of these flights with the RNAV flights. CLT facility had identified which aircraft were equipped and flew the procedure. Table AD-3.1 summarizes the results of flying times and distances for this set of aircraft. For this data set, the average flying time and distance was the same for the RNAV and non-RNAV aircraft. However, the dispersion in the flying times and distances differed. The dispersion in the flying times on the non-RNAV aircraft was 3 times larger than for the RNAV and the dispersion in the flying distances was over twice as large as for the RNAV.

**Table AD-3.1 CLT NALEY Departures**

Sept. 7 and 8	RNAV Flights (14)	Non-RNAV Flights (37)
Average Flying Time (min)	6.6	6.6
Standard Deviation (min)	.1	.3
Average Flying Distance (nm)	31.4	31.4
Standard Deviation (nm)	.4	.9

- Reduced excess gate times (duration and/or occurrence).
- Reduction in en route delay.
- Arrival rates percent effectiveness increase for airports where the en route transition sectors suffer high frequency congestion (e.g., ATL northeast arrivals).
- Allows controller to deliver the aircraft with reduced restrictions and vectoring.
- Workload reductions so controllers can reduce restrictions to aircraft and close up spacing to the separation standard.
- Assuming that the use of RNAV is the primary flight practice for arrivals, the percent of control transmissions can be reduced per day by the estimates<sup>1</sup> in the following tables.

<sup>1</sup> Estimates are generated based on real world experience of actual transmission reductions at several current locations. Estimates are based on levels of equipage and estimates of transmissions per flight in the terminal area at these locations, based on data available pre-September 11. Estimates are for airport specific populations. Revalidation of these estimates is currently underway.

The reduction in number of air/ground communications will reduce controller and pilot workload, as well as mitigating the advent of frequency congestion issues in the future. Overall effect is to maintain maximum utilization of available runway capacity.

**Table AD-3.2 Percent Reduction In Control Transmissions**

<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>
BOS	29	ATL	32	DFW	33	LAX	27	MSP	23
EWR	38	MIA	28	STL	17	PHX	33	OAK	19
ORD	42	PHL	37	LAS	37	DEN	37	DTW	20

Following September 11, ETMS flight plan data was used to compute the percent RNAV equipage at the top 25 airports by operations. The before timeframe data consisted of 8/11/01-9/6/01 and the after timeframe data consisted of 10/12/01-11/18/01. The 30 days following 9/11/01 were considered a transition period and were excluded from the analysis. It is reasonable to assume that the before RNAV equipage levels matched the levels used to produce the numbers in Table AD-3.3 above. Table AD-3.4 summarizes the percent change in RNAV equipage for these 25 airports. Note that the airports are not ordered by number of operations in the table.

**Table AD-3.3 Percent Change in RNAV Equipage Post-September 11, 2001**

<b>Airport</b>	<b>Percent Change</b>	<b>Airport</b>	<b>Percent Change</b>	<b>Airport</b>	<b>Percent Change</b>	<b>Airport</b>	<b>Percent Change</b>	<b>Airport</b>	<b>Percent Change</b>
BOS	+8	ATL	+3	DFW	0	LAX	0	MSP	+4
EWR	+4	MIA	+6	STL	+5	PHX	0	OAK	0
ORD	+5	PHL	+3	LAS	-2	DEN	+4	DTW	+5
CVG	+6	PIT	+8	IAD	+2	CLT	+2	SEA	+1
SFO	-1	SNA	-2	SBF	0	IAH	+8	MEM	+4

This table illustrates that the average RNAV equipage at these airports has increased approximately 3%. These changes in were used to update TableAD-3.3 and are given in Table AD-3.4 below:

**Table AD-3.4 Percent Reduction In Control Transmissions Post-September 11, 2001**

<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>	<b>Airport</b>	<b>Percent</b>
BOS	36	ATL	35	DFW	33	LAX	27	MSP	28
EWR	39	MIA	31	STL	22	PHX	33	OAK	19
ORD	46	PHL	39	LAS	33	DEN	40	DTW	24